

Appendix A11.1 Bat Survey and Assessment 2017

Greater Dublin Drainage Project

Bat Survey and Assessment, 2017

Draft Report, prepared for RPS

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1. Introduction

The Greater Dublin Strategic Drainage Study (GDSDS) Final Strategy Report, 2005 recommended the upgrading of all existing wastewater treatment plants (WwTP) in the Greater Dublin Area and the construction of a large WwTP in North County Dublin and an Orbital Drainage Network to divert either in full or in part some existing foul drainage catchments to this new WwTP.

The proposed Greater Dublin Drainage Scheme is comprised of the following interlinked elements:

- Regional Wastewater Treatment Plant (WwTP) to be located on a 29.8ha site in the townland of Clonsaugh in Fingal;
- Sludge Hub Centre to be co-located on the same site as the Regional WwTP;
- Orbital Sewer from Blanchardstown to the WwTP at Clonsaugh;
- Connecting sewer from the North Fringe Sewer (NFS) to the WwTP;
- Abbotstown Pumping Station to be located in the grounds of the National Sports Campus;
- Outfall pipeline from the WwTP to the outfall point approximately one kilometre north-east of Ireland's Eye; and
- Regional Biosolids Storage Facility to be located on a 11.4ha site at Newtown/ Kilshane in Fingal.

Further details on the proposals and a location map illustrating the main elements of the GDD project are included in **Chapter 4: The Proposed Scheme** in the main volume of the EIS.

Bat assessment of the proposed scheme was completed by bat specialist Mr. Brian Keeley in 2012 and 2013 and Ms. Karen Banks in 2015. This report provides an updated assessment of the potential value of the Greater Dublin Drainage project area to bats.

The aims and objectives of the survey were to:

- Establish the location of any potential bat roosts;
- Establish the value of the study area to bats for foraging and commuting;
- Assess the results of the survey and determine the potential impact of the proposed development on any bats that might use the site;
- Provide recommendations for working methodologies in light of the survey results; and
- Provide recommendations for mitigation following the survey.

This report presents the results of bat survey work carried out between May and September 2017.

2 Methodology

This bat assessment was undertaken by an experienced and licenced bat surveyor (licence no. C65/2017) over the months of May, June, July, August and September 2017 and examined the route crossed by the proposed scheme.

2.1 General

This bat survey and assessment was undertaken in accordance with the following guidelines:-

- Andrews, H. (2013). *Bat Tree Habitat Key*. Available from: www.arcol.co.uk;
- Bat Conservation Ireland, (2010). *Guidance notes for Planners, Engineers, Architects, and Developers*;
- Collins, J. (ed.) (2016). *Bat Surveys for Professional ecologists: Good Practice Guidelines* (3rd ed.). The Bat Conservation Trust, London;
- Kelleher, C. & Marnell, F. (2006). *Bat Mitigation Guidelines for Ireland*; and
- NRA (2006). *Guidelines for the Treatment of Bats During the Construction of National Road Schemes*.

2.2 Desktop Study

A pre-survey data search was conducted in order to collate existing information from the footprint of the proposed development site and its surrounding area on bat activity, roosts and landscape features that may be used by bats. The data search comprised the following information sources:

- Previous bat surveys completed for the proposed scheme¹;
- Ecological desktop and survey data gathered for the proposed scheme to determine suitable foraging, roosting and commuting areas for bats (see Chapter 10: Terrestrial Flora and Fauna of the EIS);
- Collation of known bat records from the National Bat Database held by the National Biodiversity Data Centre (www.biodiversityireland.ie); and
- Review of Ordnance Survey mapping and aerial photography of the proposed scheme area and its environs.

2.3 Field Survey

2.3.1 Preliminary Survey

A preliminary ecological appraisal of the proposed ODS corridor and WwTP at Clonshaugh was undertaken in June 2012, August 2012, September 2013 and October 2013. The route of the proposed ODS and location of WwTP was walked and areas and structures of potential value to bats were noted and marked on a map. The value of each feature was noted according to its potential for use by bats for roosting, foraging or commuting. The value of habitat features for bats was defined in accordance with *Bat Surveys for Professional Ecologists: Good Practice Guidelines*², as shown in **Table 2.1**.

¹ Keeley, B. (2013) A Bat Assessment of the Greater Dublin Drainage Project. Wildlife Surveys Ireland; Keeley, B. (2013a) Bats at the Proposed Waste Water Treatment Plant (WwTP) Site for the Greater Dublin Drainage Project at Clonshaugh, Fingal, Co. Dublin. Wildlife Surveys Ireland; RPS (2015) Greater Dublin Drainage Bat Survey and Assessment 2017.

² Collins, J. (ed.) (2016) *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (3rd edn). The Bat Conservation Trust, London.

Table 2.1: Potential suitability of habitats for bats

Suitability	Description	
	Roosting Habitats	Commuting and Foraging Habitats
Negligible	Negligible habitat features on site likely to be used by roosting bats.	Negligible habitat features on site likely to be used by commuting or foraging bats.
Low	<p>A structure with one or more potential roost sites that could be used by individual bats opportunistically. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions and/or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats (i.e. unlikely to be suitable for maternity or hibernation).</p> <p>A tree of sufficient size and age to contain PRFs but with none seen from the ground or features seen with only very limited roosting potential.</p>	<p>Habitat that could be used by small numbers of commuting bats such as gappy hedgerow or un-vegetated stream, but isolated, i.e. not very well connected to the surrounding landscape by other habitat.</p> <p>Suitable, but isolated habitat that could be used by small numbers of foraging bats such as a lone tree (not in a parkland situation) or a patch of scrub.</p>
Moderate	A structure or tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only- the assessments in this table are made irrespective of species conservation status, which is established after presence is confirmed).	<p>Continuous habitat connected to the wider landscape that could be used by bats for commuting such as lines of trees and scrub or linked back gardens.</p> <p>Habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland or water.</p>
High	A structure or tree with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions and surrounding habitat.	<p>Continuous, high quality habitat that is well connected to the wider landscape that is likely to be used regularly by commuting bats such as river valleys, streams, hedgerows, lines of trees and woodland edge.</p> <p>High quality habitat that is well connected to the wider landscape that is likely to be used regularly by foraging bats such as broadleaved woodland, tree-lined watercourses and grazed parkland.</p> <p>Site is close to and connected to known roosts.</p>

2.3.2 Activity Survey

Bat activity surveys were conducted across the proposed ODS corridor and WwTP location using an Anabat Walkabout detector, which records bat echolocation calls directly on to an internal SD memory card. Each time a bat is detected, an individual time-stamped (date and time to the second) file is recorded. Data was then downloaded and bat calls were later analysed by BatSound spectrogram sound analysis software version 4.1.

Both dusk activity surveys (from sunset, for a minimum of 120 minutes) and dawn activity surveys (from a minimum of 90 minutes prior to sunrise) were conducted. These surveys enable the identification of any obvious roost sites, a determination of the approximate numbers and species of bats present within the site, areas used for foraging, commuting routes to and from roosts and any changes in mid to late summer activity levels. The approximate flying height and direction taken by bats were estimated and detailed where possible. Handheld detectors were used while walking along sections of the route past hedgerows that will be intersected by the proposed ODS; and a driven transect was conducted in order to cover greater portions of the route than possible on foot. Specific dusk emergence and dawn re-entry surveys were undertaken of trees that were identified during the activity surveys as obvious potential roosting sites (from from approximately 15 minutes before sunset, for a minimum of 120 minutes and from a minimum of 90 minutes prior to sunrise respectively).

Assessment of bat activity was undertaken between 26th 2012 and 23rd August 2012 and in September 2013. A total of 15 dawn and dusk activity surveys were completed, and were undertaken on June 26th, 27th, July 2nd, 3rd, 4th, 5th, 6th, 31st, August 2nd, 3rd, 8th, 9th, 23rd 2012; and 9th to 10th September 2013. A total of 11 dusk and dawn activity surveys were completed in 2015 on the following dates: June 22nd, 23rd, August 10th- 12th and September 14th- 18th. A total of 13 dusk and dawn activity surveys were also completed in 2017, and were undertaken on the following dates: May 29th & 30th, June 18th, 19th & 20th, July 7th & 8th, August 9th, 10th, 11th & 12th and September 5th & 6th. All surveys were conducted in optimum weather conditions (avoiding periods of very heavy rain, strong winds (> Beaufort Force 5), mists and dusk temperatures below (10°C).

The methodology employed for the bat activity survey scheme in 2017 was largely designed to replicate that undertaken previously in 2012/ 2013 and 2015. However, in order to supplement the information gathered from the manual activity surveys, a Passive Monitoring System of bat detection was also deployed for this survey scheme (i.e. a bat detector is left in the field, there is no observer present and bats which pass near enough to the monitoring unit are recorded and their calls are stored for later analysis). This results in a far greater sampling effort over a shorter period of time, and also has the advantage that the detector can be positioned in locations that cannot be walked in the hours of darkness for health and safety reasons. Passive monitoring was completed using the Anabat Express bat monitor. Bats are identified by their ultrasonic calls. This detector system records bat ultrasonic calls on a continuous basis and stores the information onto an internal SD card. Each time a bat is detected, an individual time-stamped (date and time to the second) file is recorded.

One Anabat Express monitor was deployed for the survey and was positioned in eight different locations (illustrated in [Figure A-1](#) and [Figure A-2](#), Appendix A). The Anabat Express was positioned in hedgerows, treelines and woodland that will be severed by, or are adjacent to, the proposed ODS route, primarily in locations that cannot be accessed at night time. The detector was set to record from approximately 30 minutes before sunset until sunrise. Data was then downloaded and bat echolocation calls were later analysed by AnalookW software analysis programme. Each time-stamped file was analysed and the species of bat recorded was noted as a bat pass.

3 Existing Environment

3.1 Designated Sites

3.1.1 European Sites

The Marine-based Outfall Pipeline corridor of the proposed development passes below Baldoyle Bay SAC and pNHA [Site Code: 000199] and Baldoyle Bay SPA [Site Code: 004016], and passes through 1,370m of and also terminates within the Rockabill to Dalkey Island SAC [site Code: 003000]. It passes 200m north of Ireland's Eye SPA [Site Code: 004117] and 700m north of Ireland's Eye SAC.

These European sites are discussed further in Chapter 9: Marine Flora and Fauna of the main volume of the EIS. For location maps of SACs and SPAs in the vicinity of the proposed scheme please refer to **Chapter 10: Terrestrial Flora and Fauna** in the main volume of the EIS.

3.1.2 Other Designated Areas with Marine Components

Baldoyle Bay is also designated as a proposed Natural Heritage Area (pNHA), a Ramsar site and as a core area of the Dublin Bay UNESCO Biosphere Reserve. Ireland's Eye is a pNHA and a core area of the Dublin Bay UNESCO Biosphere Reserve. NHAs are illustrated in **Chapter 10: Terrestrial Flora and Fauna** in the main volume of the EIS.

The Dublin Bay UNESCO Biosphere Reserve comprises three zones – a core area, a buffer zone and a transitional area. It is approximately 12.5km wide, stretching from Dublin Airport in the west to its seaward termination which is coincident with the terminal diffuser field array of the proposed development. Approximately 14.5km of the proposed development including the WwTP is located within one of the three (core, buffer or transitional) areas of the Dublin Bay UNESCO Biosphere Reserve.

Ramsar sites and the Dublin Bay UNESCO Biosphere Reserve are illustrated in **Chapter 10: Terrestrial Flora and Fauna** of the main volume of the EIS.

3.1.3 Terrestrial Designated Areas

The proposed development runs underneath Baldoyle Bay pNHA. Santry Demesne is located 340m south of the proposed development where it flanks the eastbound M50 verge east of the R108 junction (M50, J4). The Royal Canal pNHA is located 350m south of the proposed development at Abbotstown. Sluice River Marsh pNHA is 910m north of the proposed development where it crosses the Belfast – Dublin railway line. Feltrim Hill pNHA is located 1.2km north of the proposed development near where it passes through the Teagasc facility at Kinsaley. These pNHAs are illustrated in **Chapter 10: Terrestrial Flora and Fauna** of the main volume of the EIS.

Bat species are not listed in the Site Synopses (www.npws.ie) as Qualifying Species of any European Site or Nationally Designated Site within 15km of the proposed ODS route.

3.2 Brief Description of Habitats

The following provides a brief description of the terrestrial habitats along the proposed ODS corridor. For further details please refer to Chapter 10: Terrestrial Flora and Fauna in the EIA, and Chapter 9: Marine Flora and Fauna for intertidal, sub-tidal and marine habitats.

Clonshagh Regional Wastewater Treatment Plant & Sludge Hub Centre

The Regional WwTP footprint overlies arable crops (BC1), horticultural land (BC2), hedgerow (WL1) and drainage ditches (FW4). These large fields are separated by three hedgerows extending north-

south. An intact mature hedgerow (with a drainage ditch) travels east-west along the south of the site.

Pumping Station at Abbotstown

The proposed construction compound overlies an arable field (BC1), immature woodland (WS2) and in part approximately 0.07 ha. of mixed broadleaved woodland (WD1) with mature broadleaved species.

Pumping Station Grange

The proposed construction compound overlies neutral grassland (GS1) and unmanaged hedgerows (WL1) with abundant Bramble. The Mayne River (a depositing lowland river - FW2) abuts this compound to the north. This grassland and the wider grassland habitat appear to be disturbed ground that has entirely re-vegetated. Approx. 2.5 ha of neutral grassland occur.

Orbital Drainage Sewer - Blanchardstown to Clonshagh

The habitats along this route include depositing lowland rivers (FW2), drainage ditches (FW4), improved agricultural grassland (GA1), wet grassland (GS4), mixed broadleaved woodland (WD1), scrub (WS1), hedgerows (WL1), spoil and bare ground (ED3), arable crops (BC1), tilled land (BC3), other artificial lakes and ponds (FL8), recolonising bare ground (ED3), horticultural land (BC2) and buildings and artificial surfaces (BL3). Arable, tilled and species poor improved fields are consistent along this route. Semi-natural habitats are very intermittent along this route.

Extensive areas of mixed broadleaved woodland (WD1) occur around the James Connolly Memorial Hospital. Intermittent Beech (*Fagus sylvatica*) occurs amid younger Sycamore (*Acer pseudoplatanus*), Pine (*Pinus* sp.) and Ash (*Fraxinus excelsior*). This woodland is included as semi-natural broadleaved woodland in the inventory of Ancient and Long Established Woodland (<http://maps.biodiversityireland.ie/#/Map>). A sizable area of unmanaged neutral grassland (GS1) also occurs with the hospital grounds.

Mixed broadleaved woodland (WD1) lies immediately northeast of the Abbotstown pumping station compound comprising mature ornamental conifers and broadleaved trees including Oak (*Quercus* sp.) and Beech.

The Cappoge area is characterised by fields of improved grassland, with disturbed soils on the periphery of these fields (recolonising bare ground - ED3). Horses graze most of the available grassland.

Proposed Compound No. 1

This compound is comprised of two enclosures of improved grassland (GS1) and horticultural land (BC2).

Improved grassland fields are the dominant habitat travelling towards the N2. Linear woodland occurs between the quarry access roads south of this enclosure. A large area of re-colonising bare ground (occurs immediately east of the N2 (Coldwinters).

Intensively farmed enclosures (tillage, horticulture and pasture) and amenity grassland are the dominant habitats approaching Ballymun. At Ballymun, recolonised bare ground (ED3) and neutral grassland (GS1) habitats occur.

Proposed compound No. 2

Spoil and bare ground (ED2) and scrub (WS1) habitats occupy this compound on either side of the approach road to the NCT centre.

Travelling east from compound two, intensively farmed lands and amenity grassland are the dominant habitats along the outer corridor. The inner corridor is dominated by car parking and other hard standing associated with Dublin Airport and local industry.

Proposed compound No. 3

This compound occurs at the Airport Road and Swords Road junction. As with compound two, the main habitat here is spoil and bare ground (ED2), with small areas of neutral grassland and recolonising bare ground (ED3).

Drainage ditches (FW4) occur throughout this route, alongside Hedgerows (WL1) comprised of native species.

Orbital Drainage Sewer - Stapolin to Clonsagh / Landbased Outfall Pipeline

The habitats along this route include drainage ditches (FW4), improved agricultural grassland (GA1), dry meadows and grassy verges (GS2), broadleaved woodland (WD1), immature woodland (WS2), scrub (WS1), hedgerows (WL1), tree lines (WL2), arable crops (BC1), horticultural land (BC2), tilled land (BC3) and buildings and artificial surfaces (BL3). Arable, tilled and improved fields again dominate this route. At Kinsealey the route overlies what appears to be willow *Salix* spp. biomass trials that have been invaded by bramble scrub. This area is mapped as scrub (WS1).

Drainage ditches (FW4) or drainage ditches with hedgerows (WL1) are common to all field boundaries. Treelines (WL2) are occasional.

Marine-based Outfall Construction Compound

This compound overlies amenity grassland (GA2) and buildings and artificial surfaces (BL3). The route leaves the compound travelling beneath the northeast corner of the old Portmarnock golf course. This habitat comprises of vegetated fixed dunes (CD3).

The main habitat types in the study area are summarised in [Table 3.1](#)

Table 3.1: Habitat types present in the Greater Dublin Drainage Project area

Fossitt Code	Habitat
FL8	Other artificial lakes and ponds
FW2	Depositing lowland rivers
FW4	Drainage Ditches
GA1	Improved agricultural grassland
GA2	Amenity grassland
GS1	Dry calcareous or neutral grassland
GS2	Dry meadows and grassy verges
GS4	Wet grassland
WD1	(Mixed) broadleaved woodland
WS1	Scrub
WS2	Immature woodland
WL1	Hedgerows
WL2	Treelines

Fossitt Code	Habitat
ED2	Spoil and bare ground
ED3	Recolonising bare ground
BC1	Arable crops
BC2	Horticultural land
BC3	Tilled land
BL3	Buildings and artificial surfaces
CD3	Fixed dunes

3.3 Existing Bat Data

The review of existing records of bat species in the area of the proposed GDD scheme indicates that eight of the ten known Irish species of bat have been recorded in the Ordnance Survey 10km x 10km grid squares O03, O04, O13, O14, O23 and O24 in which the proposed scheme is situated, or adjacent to. The species recorded in the study area are common, soprano and Nathusius' pipistrelles, Leisler's Bat, brown long-eared bat, Daubenton's bat, whiskered Bat and Natterer's bat as shown in Table 3.2 below. Roosts of seven of these species have also been identified within 5km of the proposed ODS route, but not within the footprint of the ODS corridor, and these are also shown in Table 3.2 below. Data on roosts was obtained from the National Bat Database, held by the NBDC (www.biodiversityireland.ie), and also results of previous on-site studies³.

Table 3.2: Bat records in Grid Squares O03, O04, O13, O14, O23 and O24

Common Name	Scientific Name	O03	O04	O13	O14	O23	O24	Known Roosts ⁴	Sources
Common Pipistrelle	<i>Pipistrellus pipistrellus</i>	√	√	√	√	√	√	√	NBDC Previous on-site studies
Soprano Pipistrelle	<i>Pipistrellus pygmaeus</i>	√	√	√	√	√	√	√	NBDC Previous on-site studies
Nathusius' Pipistrelle	<i>Pipistrellus nathusii</i>	√		√					NBDC Previous on-site studies
Leisler's Bat	<i>Nyctalus leisleri</i>	√	√	√	√	√	√	√	NBDC Previous on-site studies
Brown Long-eared Bat	<i>Plecotus auritus</i>	√	√	√	√	√	√	√	NBDC Previous on-site studies
Daubenton's Bat	<i>Myotis daubentonii</i>	√	√	√	√			√	NBDC Previous on-site studies
Whiskered Bat	<i>Myotis mystacinus</i>	√	√	√				√	NBDC Previous on-

³ *Ibid* 1.

⁴ Located within 5km of the pipeline corridor

Common Name	Scientific Name	O03	O04	O13	O14	O23	O24	Known Roosts ⁴	Sources
									site studies
Natterer's Bat	<i>Myotis nattereri</i>	√	√	√	√			√	NBDC Previous on-site studies
Lesser Horseshoe Bat	<i>Rhinolophus hipposideros</i>								NBDC Previous on-site studies
Brandt's Bat	<i>Myotis brandtii</i>								NBDC Previous on-site studies

The bat survey and assessments conducted in 2013 and 2015 found that the most widespread and abundant bat species recorded was the common pipistrelle. This species was present in suburban areas, urban edge and in agricultural rural lands. Soprano pipistrelle was also widespread throughout Fingal, but less so than common pipistrelle. Leisler's bat was recorded in several locations along the proposed route. Keeley (2013a) also noted that while no brown long-eared bats were recorded in the course of the surveys, the echolocation of this species is weak and consequently difficult to identify from detector survey. Brown long-eared bats are known from several locations in Fingal, therefore it is probable that this is a widespread species throughout the region.

Nathusius' pipistrelle has been recorded in few locations in the Dublin area, including the Grand Canal (2009), Phoenix Park (2008-2013) and Islandbridge (2013). Nathusius pipistrelle is associated with broadleaved woodland, wetlands and waterbodies⁵ and these habitats are not common along the proposed ODS route.

Daubenton's bat has been recorded throughout the study area, with the exception of the Grid Squares located next to the coast. A Daubenton's roost has been recorded near Castleknock, south of Blanchardstown. Daubenton's bat typically forages over water, and is also associated with broadleaved woodland. There are several records of Daubenton's bat from the River Tolka at Blanchardstown.

Whiskered bat is uncommon in Fingal. There is one record from the industrial estates north of Blanchardstown and the species is known from Phoenix Park, with a roost having been recorded to the east of Phoenix Park (1997). Records suggest that this species is associated with woodland cover, small areas of pasture, urban and scrub land cover⁶.

Natterer's bat is widespread in Ireland but is much less common in the Dublin area. There are a very small number of Natterer's bat records from Fingal and a roost has been recorded near Carpenterstown (2005). This species is associated with broadleaved woodland, riparian habitats and areas with a larger scale provision of mixed forest⁷.

⁵ Roche *et al.* 2014 Irish Bats in the 21st Century. Bat Conservation Ireland.

⁶ *Ibid* 5

⁷ *Ibid* 5

Records for lesser horseshoe bats are mainly located in Counties Cork, Kerry, Limerick, Clare, Galway and Mayo; with some records outside this core range from Sligo and Roscommon. There are no records of lesser horseshoe bat from the Fingal area.

There is one confirmed record of Brandt's bat in Ireland, recorded in County Wicklow. There are no records of Brandt's bat from the Fingal area.

3.4 Field Survey Results

3.4.1 Preliminary Survey

Features of potential use by foraging and commuting bats in the study area include areas of broadleaved mixed woodland (Blanchardstown and Abbotstown), immature woodland (Balgriffin), lowland depositing rivers (the River Tolka at Blanchardstown) and hedgerows and treelines (throughout study area). There are a number of standing trees in hedgerows within the proposed ODS corridor. None of these trees were identified as being of high potential for supporting roosting bats, or were confirmed as roost sites, however, a number were of low-moderate potential for roosting bats. There are a number of mature broadleaved trees within the woodland at Blanchardstown and Abbotstown that are of moderate potential for roosting bats.

3.4.2 Bat Activity Survey

The manual and passive detector surveys undertaken within the active season in spring, summer and autumn 2017 recorded the presence of six bat species within the study area.

Common pipistrelle was recorded in the 2017 activity surveys foraging or commuting along the hedgerows and treelines throughout the study area. As in 2013 and 2015, there were no locations that were entirely devoid of bat activity, but some locations such as in the vicinity of Dublin Airport recorded much lower bat activity. This species was most commonly recorded foraging or commuting along hedgerows adjacent to agricultural and amenity land and at the edge of broadleaved woodland.

Soprano pipistrelle was also recorded in the 2017 activity surveys foraging or commuting along the hedgerows and treelines throughout the study area. This species was recorded alongside roads, local lanes and agricultural land.

One large mature Sycamore tree in the woodland at Blanchardstown was identified as a probable bat roost for an individual soprano pipistrelle. Also, small numbers of both soprano pipistrelle and common pipistrelle were recorded at dawn swarming around two mature Oak trees in the woodland at Blanchardstown (the location of these trees is indicated in **Figure 3.5**). The bats were not directly observed entering the trees, however, in consideration of the difficulty of observing bats entering/exiting a tree roost in the poor lighting conditions present at dawn and dusk, and using the precautionary principle, these trees are recorded as probable bat roosts. During the 2015 survey, soprano pipistrelle was recorded on June 22nd emerging from a farm building at Bohammer, near Kinsaley adjacent to the ODS corridor.

Leisler's bat was recorded in 2017 commuting overhead at Blanchardstown, Baleskin, Silloge and Drumnigh. Leisler's bat was also recorded foraging along the treelines/hedgerows at Coldwinters and Portmarnock. The passive detector also recorded Leisler's bat passes at Williamsville and Silloge.

Whiskered/ Brandt's bat was recorded during the manual activity surveys foraging over the pond at Waterville Park at Blanchardstown. Daubenton's bat was recorded foraging in the broadleaved woodland to the north west of Connolly Hospital at Blanchardstown, near to the River Tolka. The passive detector also recorded a relatively high level of *Myotis* species (unidentifiable to species

level) activity in the broadleaved woodland at Blanchardstown. *Myotis* species were mainly recorded in the Blanchardstown area, indicating the importance of the woodland and aquatic habitats in this area for this genus of bats.

Single brown long-eared bat calls were recorded during the manual activity surveys in the broadleaved woodland at Blanchardstown, at broadleaved woodland edge at Abbotstown and adjacent to a hedgerow at Kinsealy. Brown long-eared bat was not recorded on the passive detector, however, as mentioned previously this species has a weak call that is difficult to pick up on detector surveys, and it is possible that this species is widespread in the study area.

The results of the surveys are summarised in [Table 3.3](#) along with the location and activity type. The calls on the passive detector are recorded as bat passes.

[Figure 3.1](#) and [Figure 3.2](#) below provide simple summary charts of the survey data. The total number of passes for each species recorded on the passive detector is illustrated in [Figure 3.1](#) and the total number of calls for each species recorded on the Anabat Walkabout during the activity surveys is illustrated in [Figure 3.2](#). For tables of the raw survey data and graphs of activity for each survey please refer to [Appendix B](#).

For maps of the bat activity survey results please refer to [Figure 3.3](#) and [Figure 3.4](#).

Table 3.3: Bat activity recorded within the GDD project area 2017

Bat Species	Location	Activity	Habitat
Common Pipistrelle	Blanchardstown	Foraging	Broadleaved woodland edge and pond
	Abbotstown	Foraging	Broadleaved woodland edge
	Coldwinters	Foraging	Pasture and treeline
	Balseskin	Foraging	Pasture and treeline
	Silloge	Foraging	Hedgerow/treeline
	Clonshagh	Foraging	Hedgerows/ treelines
	Kinsealey	Foraging/commuting	Hedgerow/treeline/ amenity
Soprano Pipistrelle	Blanchardstown	Foraging/ commuting	Broadleaved woodland and park
	Abbotstown	Foraging	Broadleaved woodland edge and improved grassland
	Balseskin	Foraging	Pasture and treeline
	Williamsville	Pass	Hedgerow/treeline
	Coldwinters	Foraging	Hedgerows/treelines lining local road
	Clonshagh	Foraging	Hedgerows/ treelines
	Kinsealey	Foraging	Conifer plantation edge
	Portmarnock	Foraging	Hedgerow/treeline
Leisler's Bat	Blanchardstown	Foraging	Broadleaved woodland
	Abbotstown	Foraging/ commuting	Broadleaved woodland edge and improved grassland

Bat Species	Location	Activity	Habitat
	Coldwinters	Foraging	Pasture & hedgerows/treelines & lining local road
	Baleskin	Foraging/ commuting	Pasture and treeline
	Williamsville	Pass	Hedgerow/treeline
	Dubber's Cross	Pass	Hedgerow/treeline
	Silloge	Pass and Foraging	Hedgerow/treeline
	Clonshagh	Foraging/ commuting	Hedgerows/ treelines
	Kinsealey	Foraging/commuting	Hedgerow/treeline/ amenity
	Portmarnock	Foraging	Hedgerows/treelines
Brown Long-eared bat	Blanchardstown	Foraging	Broadleaved woodland
	Abbotstown	Foraging	Broadleaved woodland edge
	Kinsealey	Foraging/commuting	Hedgerow/treeline/ amenity
Whiskered/ Brandt's bat	Blanchardstown	Foraging	Pond and parkland
Daubenton's bat	Blanchardstown	Foraging	Broadleaved woodland
<i>Myotis</i> spp	Blanchardstown	Pass	Broadleaved woodland
	Abbotstown	Pass	Broadleaved woodland ride
	Coldwinters	Pass	Hedgerow

Figure 3.1: Total number of bat passes recorded on the Anabat Express across the Greater Dublin Drainage Project area between May and September, 2017

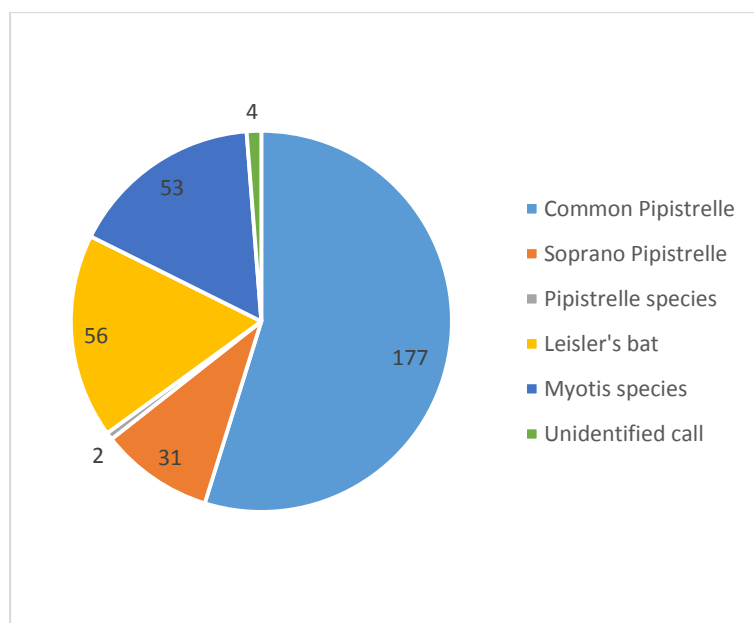


Figure 3.2: Total number of bat calls recorded on the Anabat Walkabout during the manual activity surveys across the Greater Dublin Drainage Project area between May and September, 2017

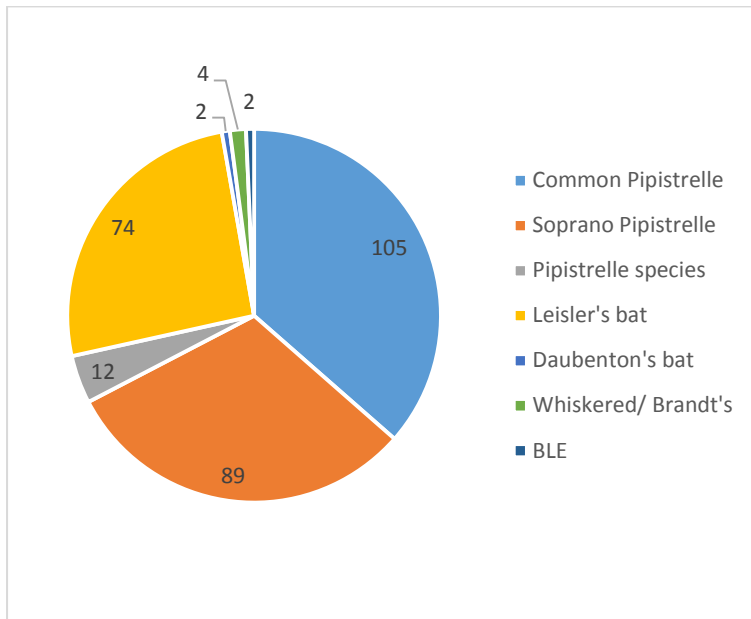


Figure 3.3: Bat survey results 2017: Blanchardstown to Dublin Airport

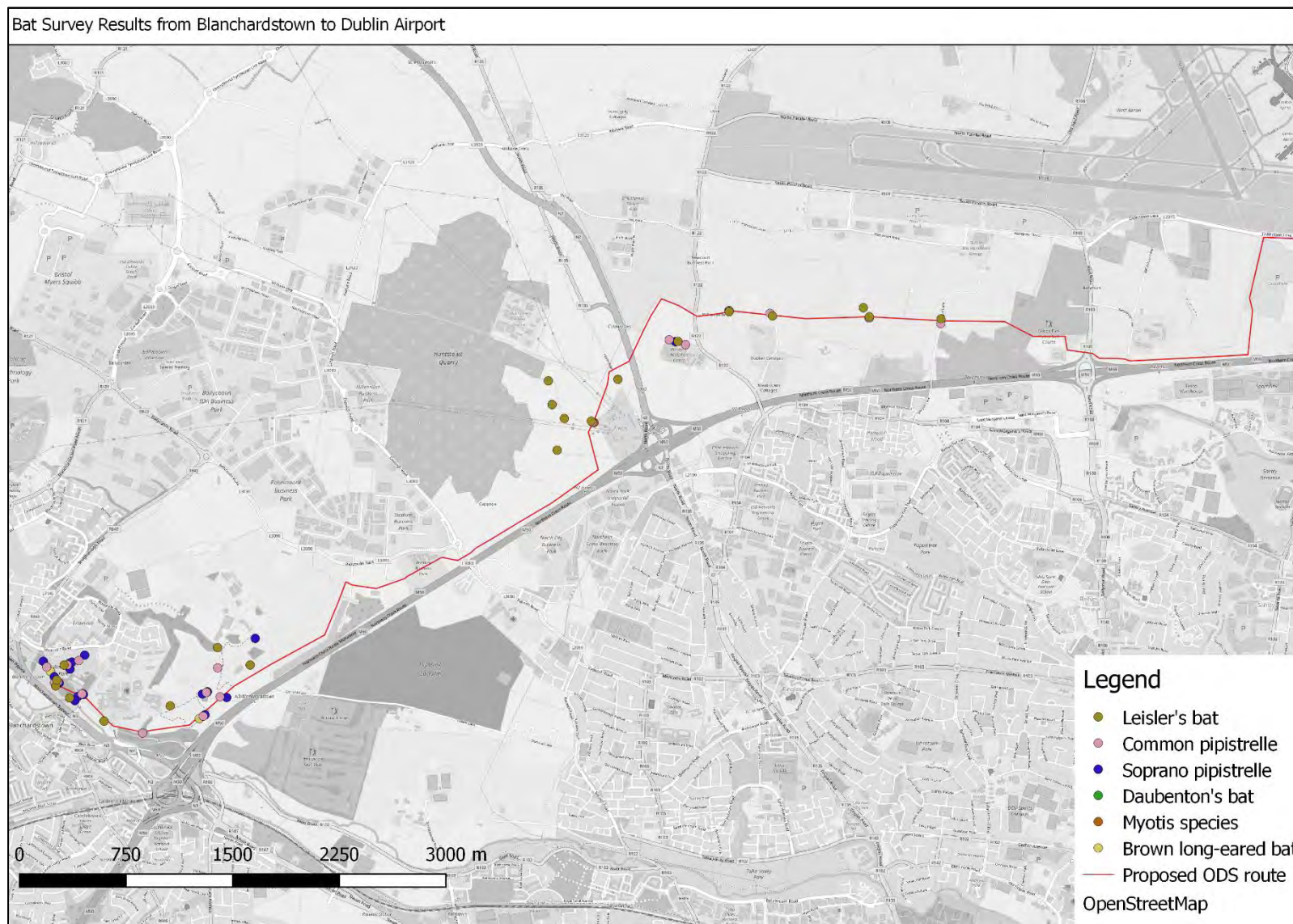


Figure 3.4: Bat survey results 2017: Dublin Airport to Portmarnock



3.5 Evaluation

3.5.1 Analysis and interpretation of results

The principal areas of ecological interest in relation to bats present on or near the proposed ODS corridor include:

- **Hedgerows and treelines.** The improved grassland and arable land covering the majority of the study area is of low conservation interest, and is of low interest to bats. However, many of the hedgerows which bound field systems offer connectivity in the landscape and shelter for commuting and foraging bats. Some of the older trees within hedgerows offer some potential roosting opportunities for individual/ small numbers of bats. Therefore the hedgerows and treelines in the study area are considered as being of **local value**.
- **Woodlands and watercourses.** The woodland along the River Tolka and the connected broadleaved woodland at Blanchardstown and Abbotstown provide an important foraging area and commuting corridor for bats, particularly as the woodland is associated with a watercourse, and there are potential roosting opportunities in mature trees. Therefore, this habitat is considered as being of **local value**.

Known and Potential Bat Roosts

The following information on bat roosting preferences has been adapted from *Irish Bats in the 21st Century*⁸ and *Bat Surveys for Professional Ecologists*⁹. The roosting preferences of bat species that have either been confirmed as present, or are likely to be present, in the study area are described.

Common pipistrelle maternity colonies are mainly found in buildings, usually roosting out of sight in crevices. This species has been observed using a range of building types from flat roofed-sheds to churches, however, using Irish roost preference modelling this species was found to select buildings of stone construction. Males roost singly or in small groups in the summer, in buildings or trees. Bat boxes are used by both males and females, but generally only males use them during the summer. Common pipistrelle has also been recorded in bridges in Ireland. This species has not been recorded using underground sites for hibernation in Ireland but is sometimes found in cracks and crevices of buildings and bat boxes in winter.

Soprano pipistrelle maternity colonies are mainly found in buildings, and as for common pipistrelle, usually roost out of sight in crevices. Soprano pipistrelle has been recorded using a range of building types from toilet blocks to churches, however, Irish roost preference modelling showed that buildings of brick construction were the only selected maternity roost feature. Males roost singly or in small groups in the summer, in buildings or trees. Bat boxes are used by both males and females, but generally only males use them during the summer. Soprano pipistrelle has also been recorded in bridges in Ireland. This species has not been recorded using underground sites for hibernation in Ireland but is sometimes found in cracks and crevices of buildings and bat boxes in winter.

The majority of Leisler's bat roosts in Ireland are found in buildings, and roosts have also been recorded in bat boxes and trees. This species has not been found roosting in underground structures in Ireland or Europe. While Leisler's have been found in a range of building types, modelling of Irish roost records indicates that it favours buildings of stone construction with a felt lining in the roof.

⁸ *Ibid* 5

⁹ Collins, J. (ed.) (2016) *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (3rd edn). The Bat Conservation Trust, London.

Brown long-eared bat maternity roosts are found in trees, in voids of large old buildings and bat boxes in woodland, and rarely in caves. Confirmed hibernacula for the species are extremely rare in Ireland, but in the UK have been recorded in underground sites, trees and buildings. Brown long-eared bats have been found in a range of building types, from old mills to bungalows; this species is known to favour roosting in buildings with large attic spaces. Modelling of Irish roost records indicates that this bat generally favours roosting in churches.

Daubenton's bat roosts are found in hollow trees, bridges and sometimes buildings and caves. The majority of roost records in Ireland are from stone bridges. Confirmed hibernacula records for this species are rare in Ireland; in the UK hibernation sites are mainly underground, in caves, mines and tunnels.

The majority of whiskered bat roosts in Ireland are found in buildings and one roost has been recorded in a tree. There are no confirmed hibernacula for this species in Ireland, but in continental Europe it is frequently found in caves and mines in winter. Modelling of Irish roost records suggests that whiskered bat favours buildings of stone construction.

Potential Bat Roosts

One soprano pipistrelle was recorded before sunset on 19th June 2017 in the woodland at Blanchardstown and, as noted in **Section 3.4.2**, a large mature Sycamore tree in the woodland was identified as a probable bat roost for individual soprano pipistrelle (please refer to **Table B-3, Appendix B** for times of first bat passes recorded in relation to sunset). Small numbers of both soprano pipistrelle and common pipistrelle were recorded at dawn swarming around two mature Oak trees in the woodland at Blanchardstown (for the location of these trees refer to **Figure 3.5**). No further evidence of bats roosts in trees was found during the course of the bat survey of the proposed GDD project area conducted in 2017, or in previous surveys conducted in 2012-2013 and 2015. A number of mature trees were identified along the proposed ODS corridor that are of low-moderate potential for use by bats as roosting or resting places. These trees may be used by individuals or small numbers of bat species but it is considered to be unlikely that large numbers of bats roost in trees in the study area.

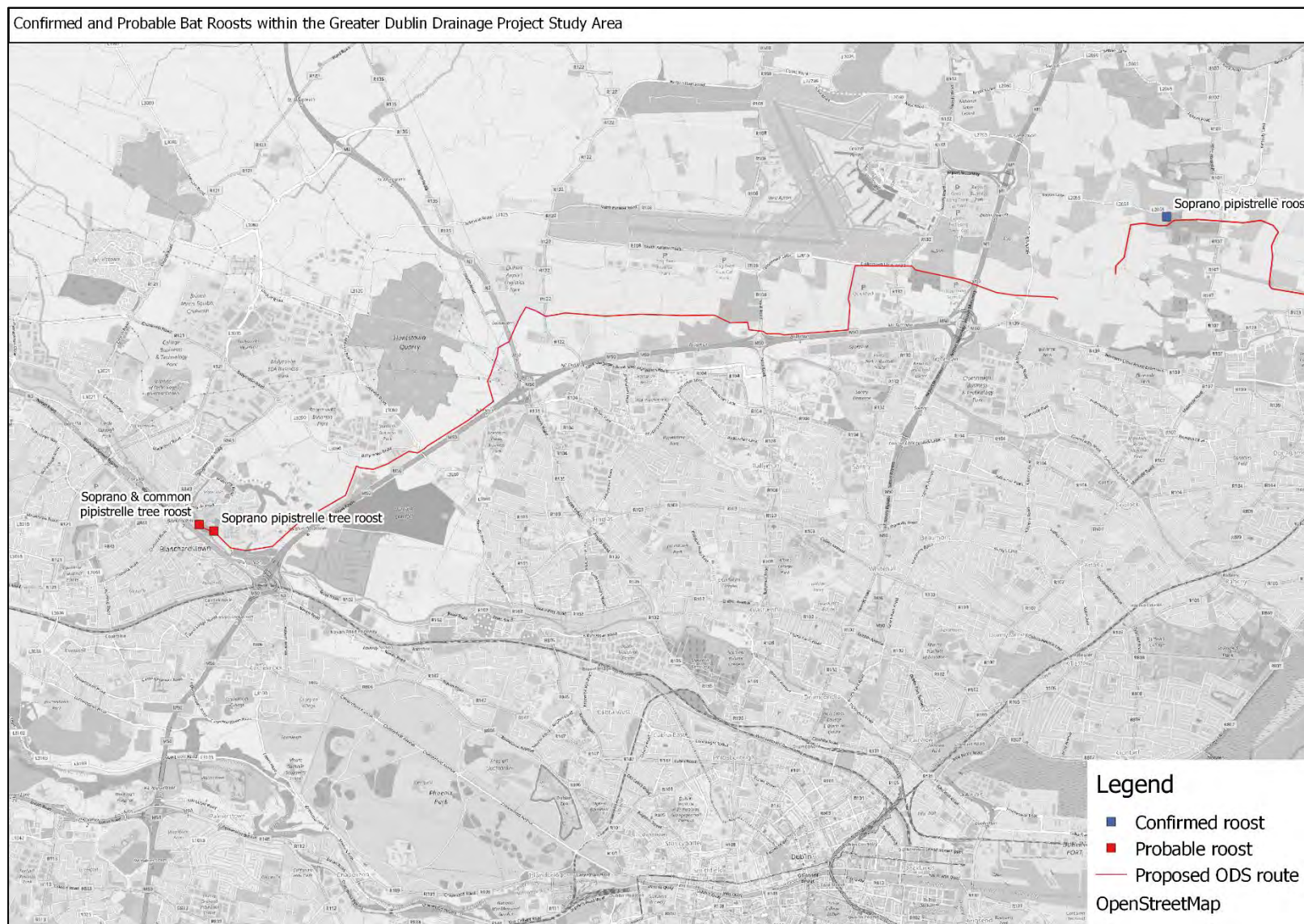
Leisler's bat was recorded at Coldwinters early in the evening during surveys in 2013 and again in 2017 (recorded fourteen minutes before sunset on 10th August, 2017, see **Table B-3, Appendix B**). The nearest roosting site at Coldwinters was not shown to be a roost site in 2013 or 2017. As noted previously, the trees within the ODS corridor may be used by individuals or small numbers of bat species but are not suitable to support larger numbers of bats (i.e. a maternity roost).

Known Bat Roosts

As noted in **Section 3.4.2**, soprano pipistrelle was recorded on June 22nd 2015 emerging from a farm building at Bohammer, near Kinsaley, adjacent to the proposed ODS corridor. The location of this bat roost is indicated on **Figure 3.5**. During the course of the bat surveys undertaken in 2015, soprano pipistrelle and common pipistrelle were recorded early in the evening at Silloge and soprano pipistrelle was also recorded early in the evening at Drumnigh. These areas were re-surveyed in 2017 and no-evidence of roosts was observed within the proposed development footprint or its immediate environs at these locations.

It is noted that no structures within the proposed ODS corridor will require demolition as part of the project.

Figure 3.5: Bat roosts recorded in the Greater Dublin Drainage Project area



3.5.2 Legislation

The following bats have been recorded during this survey: common pipistrelle, soprano pipistrelle, Leisler's bat, Daubenton's bat, whiskered bat, *Myotis* species and brown-long-eared bat.

All Irish bats are protected under the Wildlife Act (1976) and Wildlife Amendment Act (2000). Also, the EC Directive on The Conservation of Natural Habitats and of Wild Fauna and Flora (Habitats Directive 1992), seeks to protect rare species, including bats, and their habitats, and requires that appropriate monitoring of populations be undertaken. Across Europe they are further protected under the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention 1982), which, in relation to bats, exists to conserve all species and their habitats. The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention 1979, enacted 1983) was instigated to protect migrant species across all European boundaries. The Irish government has ratified both these conventions¹⁰.

All bats are listed in Annex IV of the EU Habitats Directive (92/43/EC) and the Lesser Horseshoe bat is further listed under Annex II of the same Directive.

Local Planning Authorities are required to give consideration to nature conservation interests under the guidance of the SEA Directive 2001/42/EC. This Directive states that the protected status afforded to bats means that planning authorities must consider their presence in order to reduce the impact of developments through mitigation measures.

Destruction, alteration or evacuation of a known bat roost is a notifiable action under current legislation and a derogation licence has to be obtained from the National Parks and Wildlife Service (NPWS) before works can commence.

In addition, it should be noted that any works interfering with bats and especially their roosts, may only be carried out under a licence to derogate from Regulation 23 of the Habitats Regulations 1997, (which transposed the EU Habitats Directive into Irish law) issued by the NPWS. The details with regards to appropriate assessments, the strict parameters within which derogation licences may be issued and the procedures by which and the order in relation to the planning and development regulations such licences should be obtained, are set out in Circular Letter NPWS 2/07 "*Guidance on Compliance with Regulation 23 of the Habitats Regulations 1997 - strict protection of certain species/applications for derogation licences*" issued on behalf of the Minister of the Environment, Heritage and Local Government on the 16th of May 2007.

¹⁰ Aughney, T., Kelleher, C., & Mullen, D. (2008): Bat Survey Guidelines, Traditional Farm Buildings Scheme. Heritage Council, Kilkenny

4 Impact Assessment

4.1 Impact of the Proposed Project- Construction

The results of the 2017 survey and previous 2012/2013 & 2015 surveys conducted for the proposed scheme indicate that the study area supports at least six species of bat. Furthermore, there are existing records of eight bat species from the 10k Grid Squares the ODS route is situated in. Due to their use of wide areas of landscape and their low birth rate, bats are vulnerable to potential impacts from linear developments such as ODS installations.

The principle potential impacts of the proposed Greater Dublin Drainage project are as follows:

1. Loss of treelines and hedgerows or other linear features during construction will impact on commuting and foraging bats.

The removal of foraging and commuting habitat would have a direct, significant adverse impact on bats at the local level. In the absence of mitigation this impact would be permanent and irreversible.

2. Loss or fragmentation of foraging habitats (such as hedgerows, treelines and woodlands) may reduce the available insect prey species and also reduce feeding area for bats in some locations.

The reduction of foraging habitat would have a direct, significant adverse impact on bats at the local level. In the absence of mitigation this impact would be permanent and irreversible.

3. Loss of mature trees may reduce actual and potential roosting sites for individual bats.

One mature Sycamore and two mature Oak trees have been identified as probable roosts for individual/ small numbers of bats at Blanchardstown. While no bat roosts were identified in the remainder of the proposed ODS route, occupation of roosts in trees by bats may be very transient and there is potential that the mature broadleaved trees in the footprint of the proposed route may be used occasionally as roosting or resting places by individual/ small numbers of bats. Therefore, there is potential for significant direct adverse impacts to individual bats should mature broadleaved trees be removed during the construction phase. This would be significant at the local level.

4. Disturbance of bats due to lighting during the construction phase.

When bats emerge from roosts they tend not to echolocate but rely on eyesight to fly from the roost to adjoining treelines or hedgerows. Various studies have shown that bats' eyesight works best in dim light conditions; where there is too much luminance bats' vision can be reduced resulting in disorientation. Too much luminance at bat roosts may cause bats to desert a roost. Light falling on a roost exit point can delay bats from emerging and miss peak levels of insect activity at dusk: any delays of emergence can reduce feeding periods. Studies have also found that lighting can cause avoidance of an area for commuting bats and can prevent or reduce foraging for *Myotis* species and brown-long-eared bats¹¹.

Should construction lighting be required, there is potential that the disturbance of bats due to lighting would have an indirect, significant adverse impact at the local level. The impact would be temporary, and would persist for the duration of construction.

¹¹ Stone E.L. (2013) Bats and Lighting: Overview of current evidence and mitigation.

4.2 Impact of the Proposed Project- Operation

After construction and reinstatement the level of works within the wayleave will be restricted to occasional routine walkover inspections and access for maintenance. These walkovers would not be expected to have any significant impacts on bats.

Should the proposed WwTP and Sludge Hub Centre at Clonshagh be lit at night, there is potential for disturbance to bats due to lighting. As detailed in **Section 4.1**, bats' eyesight works best in dim light conditions; where there is too much luminance bats' vision can be reduced resulting in disorientation. In the absence of mitigation, disturbance of bats due to lighting would have an indirect, significant negative impact at the local level.

5 Mitigation Measures

The most ideal way to mitigate impacts is through avoidance. The following measures would avoid or lessen the impacts of the scheme.

a) Avoidance

- Ensure that hedgerow and treeline removal is minimised where possible.
- The area of mixed broadleaved woodland present around the James Connolly Memorial Hospital (identified as being an important foraging area and supporting mature trees with probable bat roosts) that is not required for clearance should be protected from damage.
- Mature trees adjacent to the proposed ODS route should remain in place wherever feasible.

b) Reduction

Tree roosts may be established for short periods and may not be detectable when bats are not occupying the roost from an examination of a suitable tree. Furthermore, trees may become suitable for roosting bats through damage from storm, machinery, rot or human interference; therefore trees that are at present unsuitable may become roosts between the pre-planning assessment contained within this report and construction. All trees within the land take shall be checked for suitability as a bat roost by an experienced bat ecologist as part of a pre-construction survey.

Resulting from that pre-construction bat roost suitability survey, all trees with medium to high roost potential, including those identified in this report as probable roosts (**Figure 3.5**), shall be examined by an experienced bat ecologist reporting to the Ecological Clerk of Works, prior to work commencing by any contractor or subcontractor on any part of the enabling works phase of the project including fencing, vegetation clearance or topsoil stripping (see also section (c) below).

Removal of hedgerows, treelines or strips of woodland shall be restricted to the minimum area required for the proposed development within the wayleave. Where there is no alternative to removal, planting schemes shall be provided to close gaps in the linear feature caused by the development. Small trees and shrubs from removed sections of hedgerows and lines of trees can be replanted, or otherwise trees and shrubs of native stock used. The exact locations of such planting should be designed at detailed landscaping stage.

In general, best practice design shall aim to retain the quality of the landscape where possible and ensure its protection within the landscaping strategy. Existing semi-natural scrub, semi-natural woodland or semi-natural grasslands shall be retained where possible and incorporated into the landscaping programme.

The project corridor shall be fenced off prior to the commencement of any activity in accordance with the construction contract to prevent unnecessary damage or degradation to semi natural habitats adjacent to the proposed ODS corridor. Where possible, treelines, woodland and mature trees that are located immediately adjacent to the line of the proposed ODS wayleave and construction area which will not be removed shall be avoided and retained intact. Overall impacts on these sites shall be reduced through sensitive construction techniques. Any existing mature trees adjacent to the corridor or construction areas which will not be removed shall be protected from root damage in accordance with BS 5837:2012 *Trees in relation to design, demolition and construction* as part of the construction contract.

Where removal of mature trees is unavoidable, these trees shall ideally be felled in the period late August to late October, or early November, in order to avoid the disturbance of any roosting bats as per TII guidelines¹². Tree felling shall be completed by Mid-November at the latest because bats roosting in trees are very vulnerable to disturbance during their hibernation period (November – April). Once felled, trees that have potential bat roost features shall be left intact on-site for 24 hours prior to disposal to allow any bats to escape overnight.

Landowners shall be advised that the timber from felled trees will remain for their use. This should prevent trees being felled prematurely.

c) Derogation Licence

Three trees have been identified as probable bat roosts as part of this assessment (Figure 3.5). Should the removal of these trees be required for construction; or in the event that a pre-construction bat roost suitability survey or tree cavity examination by an experienced bat ecologist reveals a roost, then a licence application will be made to NPWS as part of planning condition discharge and compliance with the construction contract seeking derogation from the National Parks and Wildlife Services to exclude the bats and fell the tree. The roost must not be altered or affected in any way prior to the time and using the measures stipulated in the licence for the exclusion of bats and felling must be carried out under the supervision of a bat specialist named on the licence.

d) Bat Boxes

The loss of potential roosting features in trees as a result of vegetation clearance will necessitate the installation of bat boxes to compensate for potential roost loss. It is recommended that bat boxes are attached to suitable trees or buildings along the route but outside the area of clearance. The principle recommended type along the pipeline corridor is the Schwegler 1FF bat box. Boxes shall be erected in pairs and all boxes placed in sites that will be protected from disturbance. These boxes must be away from any felling or trimming to ensure that they are not accidentally damaged or removed. Bat boxes must be clear of scrub and away from ivy encroachment as well as lighting and traffic. The appropriate number of bat boxes to compensate for loss of potential roosting features should be calculated following pre-construction PRF inspection/ presence absence surveys.

5.1.1 Lighting

Where construction lighting is required, lighting shall be directed away from all woodland, hedgerow and linear habitats to be retained. This can be achieved by the use of directional lighting (i.e. lighting which only shines on the proposed works and not nearby countryside) to prevent overspill. This shall be achieved by the design of the luminaire and by using accessories such as hoods, cowls, louvres and shields to direct the light to the intended area only.

Landscaping treatment for the WwTP includes planting of hedgerow, specimen trees and wildflower meadow to the north, east and west of the site. This will provide a potential foraging area for bats. Lighting shall be minimised in these areas, and the times during which the lighting is on should be limited to provide some dark periods. Should security lighting be necessary, directional lighting shall be used to prevent overspill.

There shall be no direct illumination of known bat roosts. Lights shall be positioned to avoid sensitive areas and restricted so that there are dark areas. When works are conducted adjacent to known or

¹² National Roads Authority (2005): Guidelines for the Treatments of Bats Prior to the Construction of National Road Schemes. National Roads Authority, Dublin.

potential bat roosts (as identified in [Figure 3.5](#)), the timing of lights shall be restricted to avoid bat activity (i.e. from dusk until dawn).

5.1.2 Monitoring

It is essential to monitor boxes for their acceptance of use by bats and those boxes that remain unused two years after the date of erection should be relocated. Seasonal inspection of bat boxes should be undertaken (excluding mid-June to mid-August, the lactation period of females, where any disturbance at this time can be detrimental to survival of young) to monitor bat usage and in wintertime for general wear and tear and to remove droppings following use the previous summer. This should be undertaken by a licensed bat-handler¹³.

5.2 Residual Impacts

There will be a period of up to five years while vegetation re-establishes itself. If best practice is followed during the construction and operation of the proposed Greater Dublin Drainage scheme, with the recommendations given in this report followed, including the suggested mitigation measures, the residual impact of the development in terms of impacts on bats may be considered as negligible.

5.3 Difficulties Encountered In Compiling Required Information

The bat activity survey was undertaken in accessible areas to allow for safe surveying. Health and Safety concerns with night survey include difficulty of terrain, livestock and human interference. Taking these factors into account, the activity surveys concentrated on parts of the route with safe access. Areas that could not be accessed primarily comprised built land such as schools, retail or industrial parks, temporary halting sites and a small proportion of highly modified agricultural/arable land. It is considered highly unlikely that any areas of high importance for bats were missed.

¹³ National Roads Authority (2005): Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes. National Roads Authority, Dublin.

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Appendix A

Map of Anabat Express Deployment Locations

Figure A-1: Deployment locations of Anabat Express between Blanchardstown and Dublin Airport, 2017

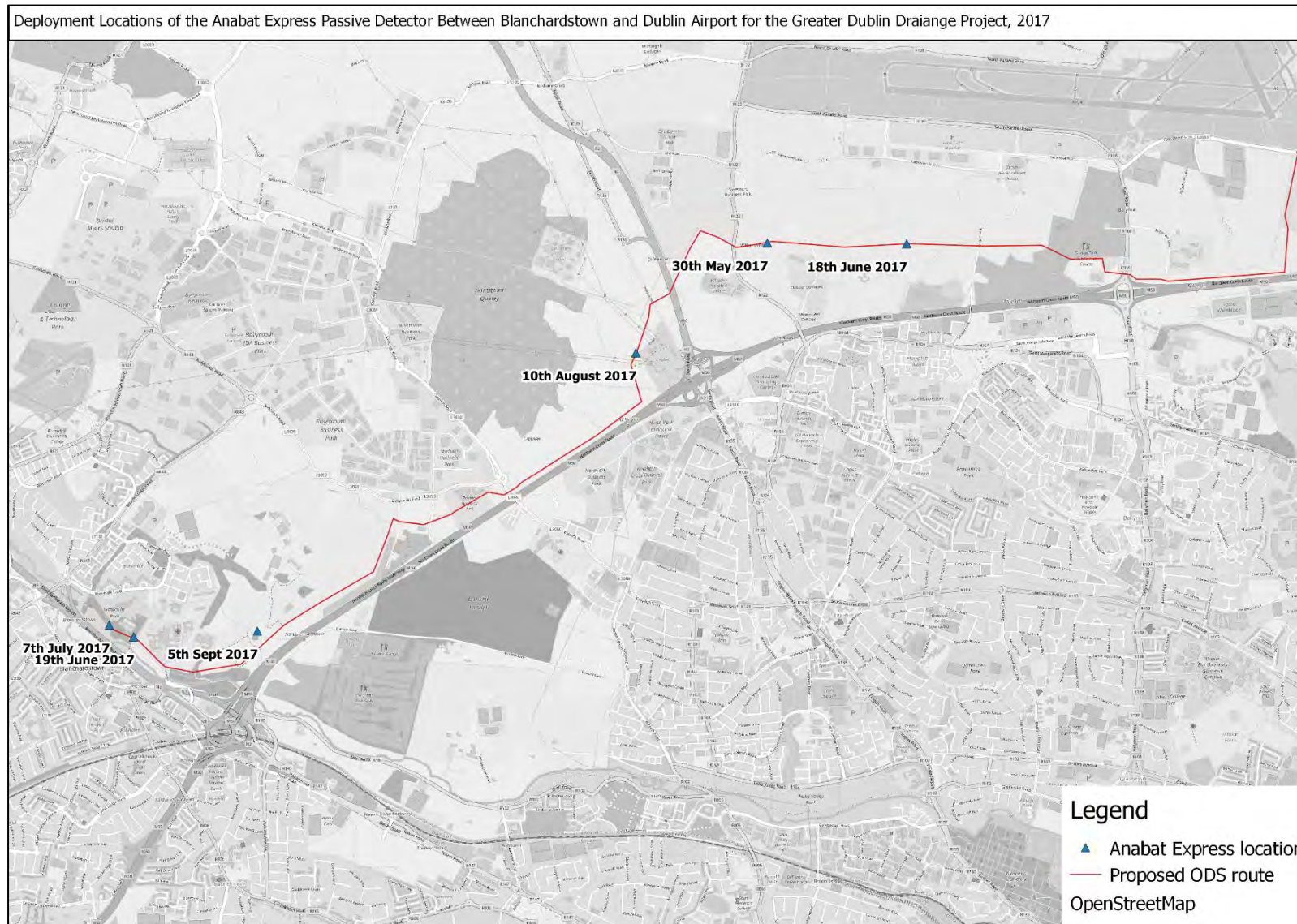
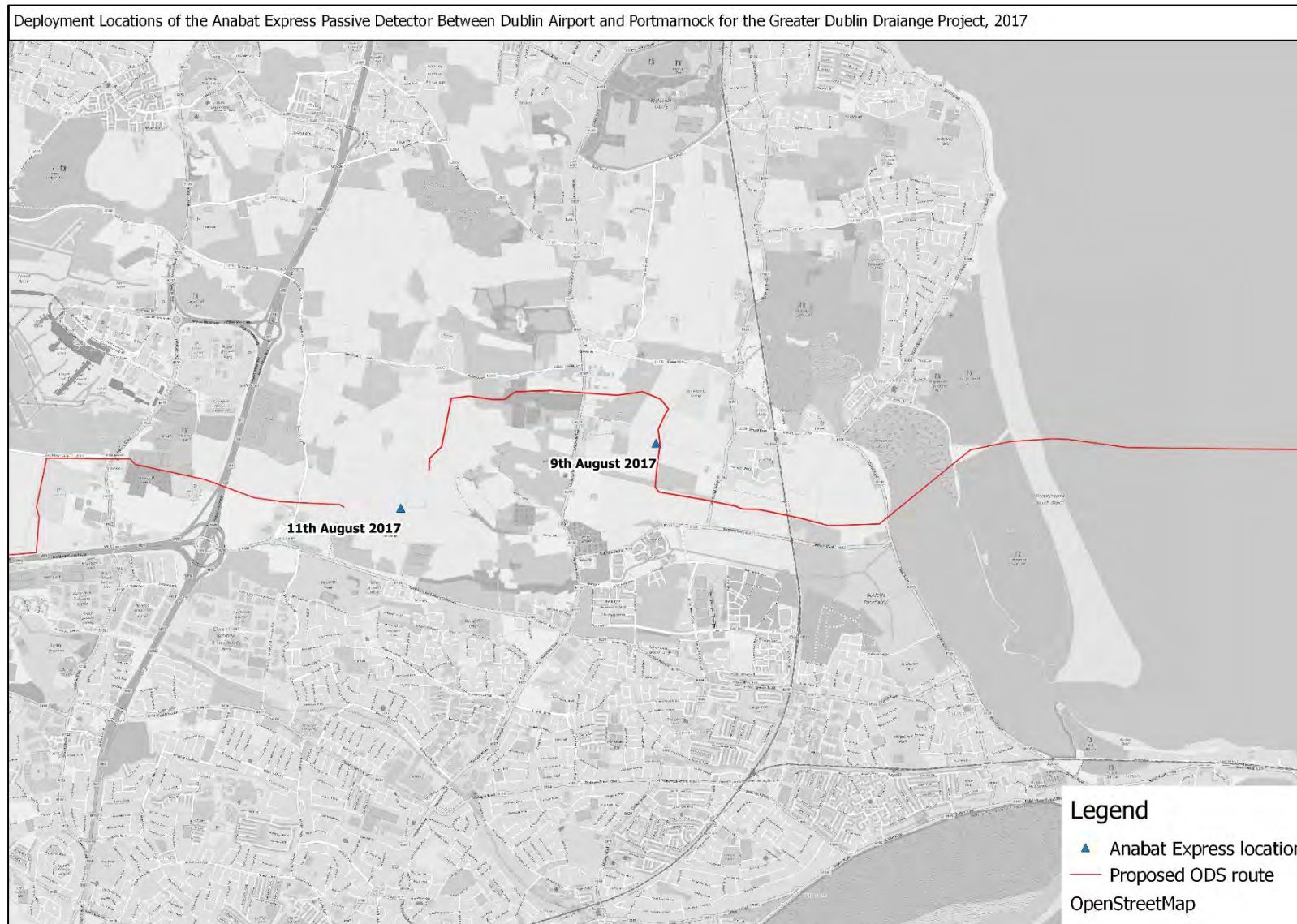


Figure A-2: Deployment locations of Anabat Express between Dublin Airport and Portmarnock, 2017



Appendix B

Survey Data

Table B-1: Passes recorded per night of survey on the Anabat Express across the Greater Dublin Drainage Project area, 2017

Date	Species						Total Passes Per Night
	Common Pipistrelle	Soprano Pipistrelle	Pipistrelle species	Leisler's bat	<i>Myotis</i> species	Un-ID	
30-05-17	104	10	2	31	0	0	147
18-06-17	2	0	0	10	0	0	12
19-06-17	0	10	0	0	50		60
07-07-17	16	1	0	0	1	2	20
09-08-17	4	6	0	3	0	0	13
10-08-17	2	0	0	9	1	0	12
11-08-17	45	1	0	3	0	2	51
05-09-17	4	3	0	0	1	0	8
Total Number of Bat Passes Per Species	177	31	2	56	53	4	323

Table B-2: Calls recorded on the Anabat Walkabout during dawn and dusk activity surveys across the Greater Dublin Drainage Project area, 2017

Date	Species							Total
	Common Pipistrelle	Soprano Pipistrelle	Pipistrelle Species	Leisler's Bat	Daubenton's Bat	Whiskered/Brandt's Bat	Brown Long-eared Bat	
29-05-17	18	1	2	38	0	0	0	59
30-05-17	1	4	0	19	0	0	0	24
18-06-17	0	1	0	1	0	0	0	2
19-06-17	6	13	0	3	0	0	0	22
20-06-17	37	8	1	4	0	0	0	50
07-07-17	1	6	3	6	2	0	0	18
08-07-17	5	23	5	3	0	4	0	40
09-08-17	36	22	2	24	0	0	1	85
10-08-17	0	0	1	13	0	0	0	14
11-08-17	7	4	0	1	0	0	0	12
12-08-17	0	0	0	0	0	0	0	0
05-09-17	12	8	2	6	0	0	1	29
06-09-17	3	0	0	13	0	0	0	16

Date	Species							Total
	Common Pipistrelle	Soprano Pipistrelle	Pipistrelle Species	Leisler's Bat	Daubenton's Bat	Whiskered/Brandt's Bat	Brown Long-eared Bat	
Number of bat calls	105	89	12	74	2	4	2	296

Table B-3: First passes of bat species recorded on the Anabat Express across the Greater Dublin Drainage Project area 2017 in relation to sunset, showing minutes recorded before and after sunset

Date	Common Pipistrelle	Soprano Pipistrelle	Leisler's bat	<i>Myotis</i> species
30-05-17	+50	+317	+30	n/a
18-06-17	+165	n/a	+58	n/a
19-06-17	n/a	-8	n/a	+74
07-07-17	+306	+242	n/a	+47
09-08-17	+57	+51	+38	n/a
10-08-17	+126	n/a	-14	+75
11-08-17	+44	+297	+49	n/a
05-09-17	+36	+124	n/a	+124

Figure B-1: Passes recorded per night of survey on the Anabat Express across the Greater Dublin Drainage Project area, 2017

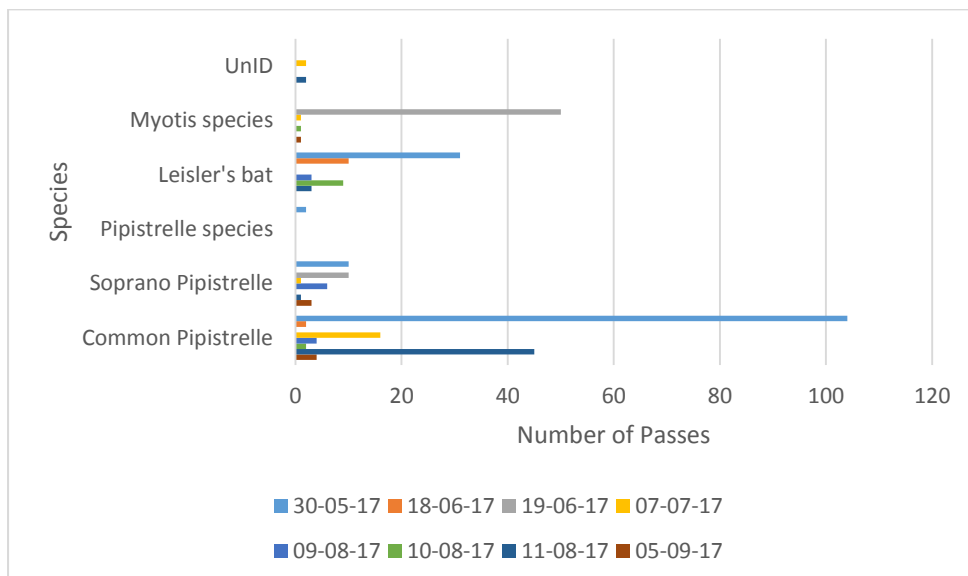


Figure B-2: Bat calls recorded on the Anabat Walkabout across the Greater Dublin Drainage Project area in May 2017

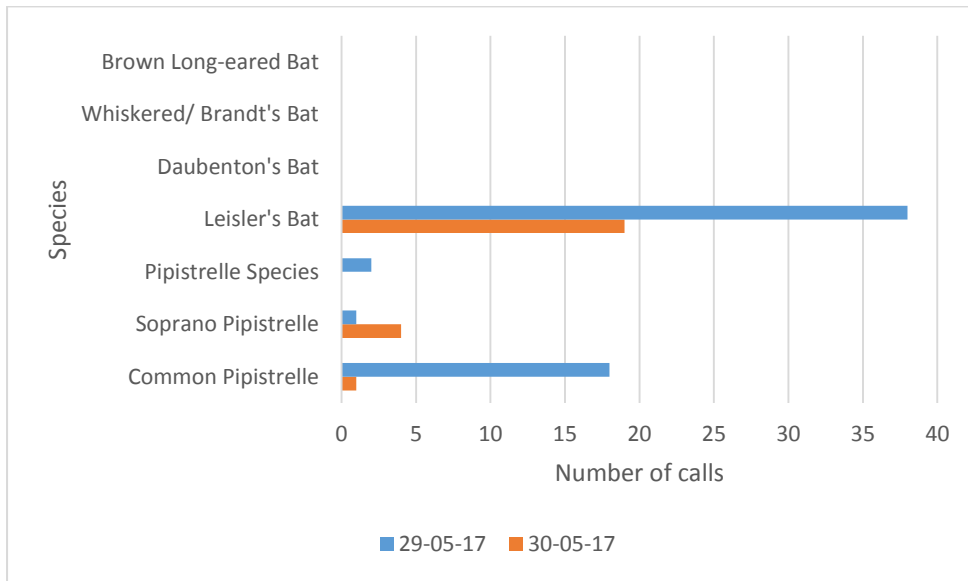


Figure B-3: Bat calls recorded on the Anabat Walkabout across the Greater Dublin Drainage Project area in June 2017

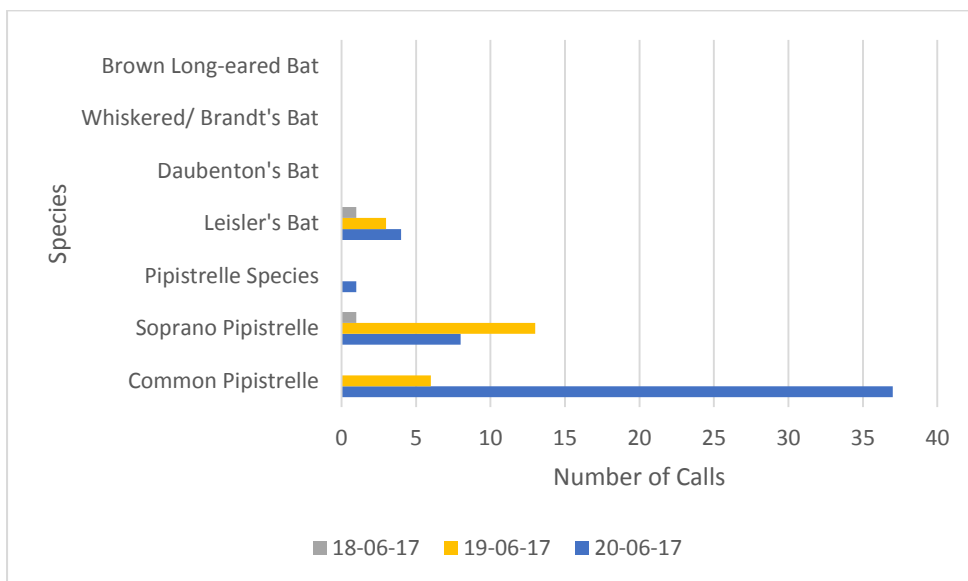


Figure B-4: Bat calls recorded on the Anabat Walkabout across the Greater Dublin Drainage Project area in July 2017

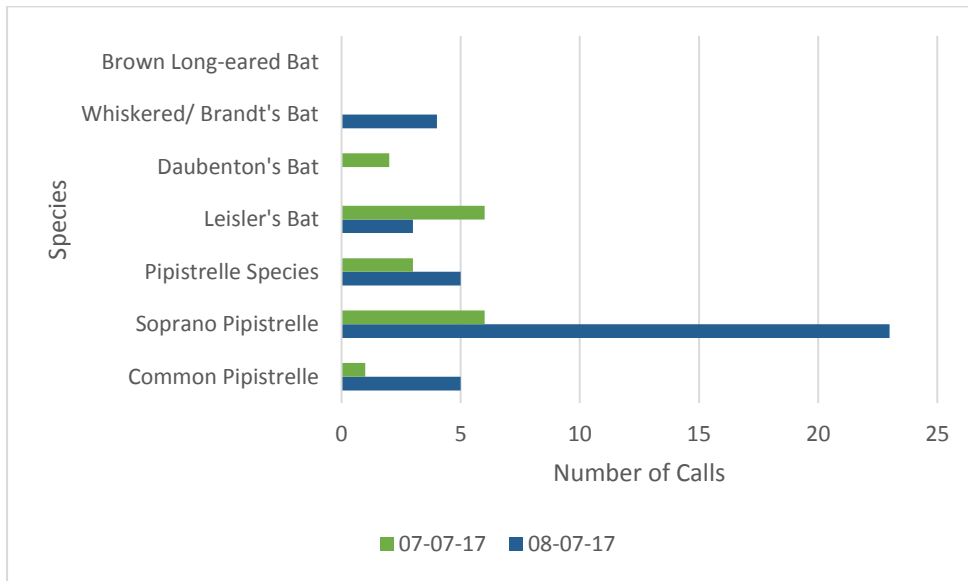


Figure B-5: Bat calls recorded on the Anabat Walkabout across the Greater Dublin Drainage Project area in August 2017

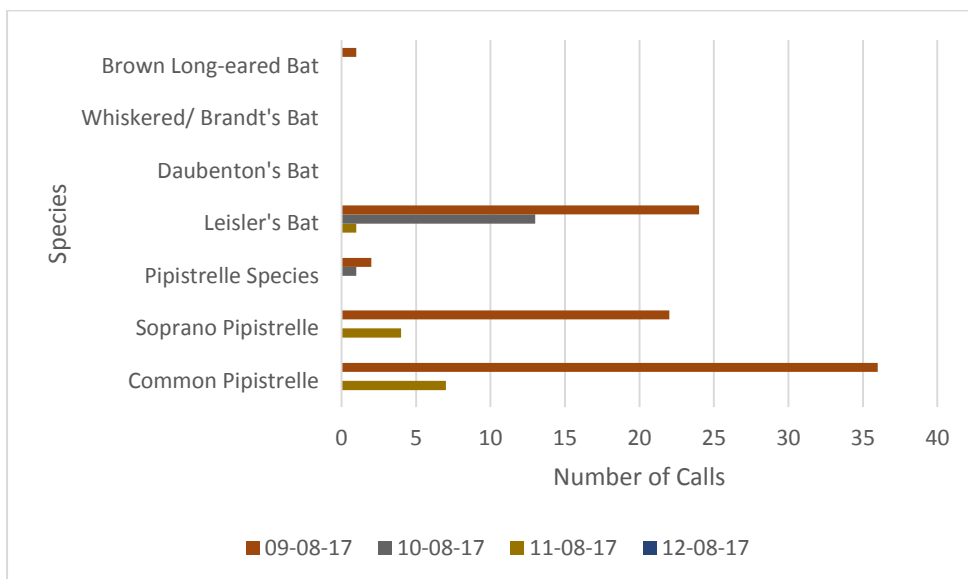


Figure B-6: Bat calls recorded on the Anabat Walkabout across the Greater Dublin Drainage Project area in August 2017

